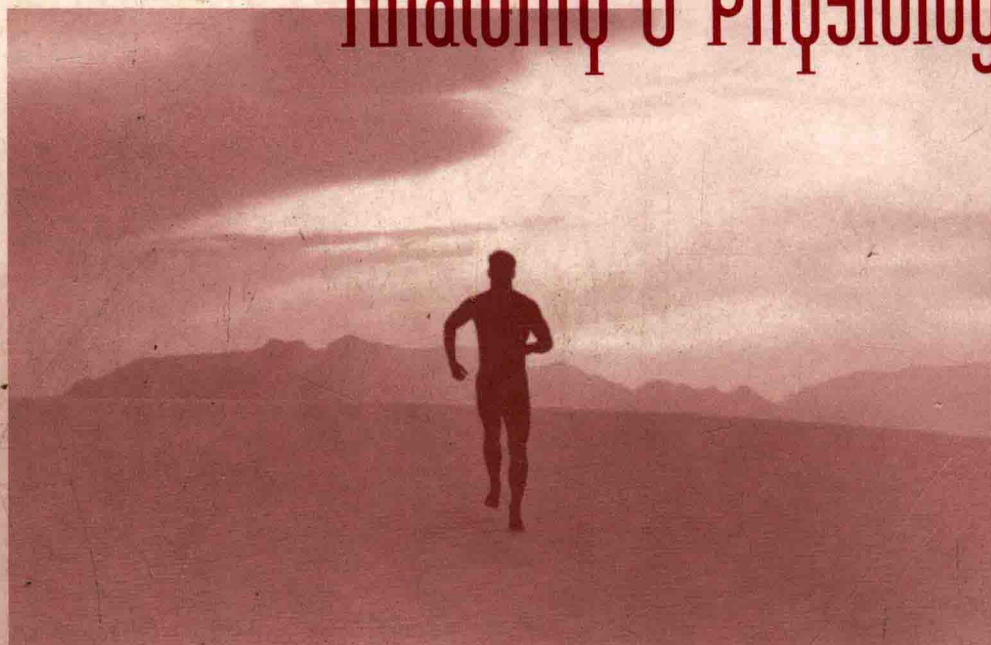


Hole's 人体解剖生理学

Hole's
human
e i g h t h e d i t i o n

Anatomy & Physiology



David Shier

Jackie Butler

Ricki Lewis



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Hole's 人体解剖生理学

by Shier et al.

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PREFACE

Revising a textbook is a little like caring for a car. Sometimes a complete overhaul is needed; other times, a simple tune-up will do. For this eighth edition of *Hole's Human Anatomy and Physiology*, we felt that a tune-up and polish were in order. The last edition was changed substantially. This time around, we considered what adopters liked and what they didn't like, while updating the factual material and greatly improving both the verbal and visual clarity of the presentation. The result, we hope, is an even more exciting introduction into the workings of the human body.

FAVORITE FEATURES

Introductory Vignettes True-to-life vignettes begin each chapter with a glimpse of relevancy. Despite the popularity of many of the vignettes from the last edition, we have replaced several—too many exciting new events in medical science forced us to! Some vignettes explore molecular and cellular explanations for whole-body phenomena: how a inflamed pancreas reflects a faulty gene (chapter 2); why some people can't get AIDS (chapter 3); a teen who dies when a bacterial toxin in spoiled spaghetti halts mitochondrial function (chapter 4). Others explore illness: a woman who lost her skin (chapter 6), a girl who couldn't smile (chapter 9), and a description of gout—in *Tyrannosaurus rex* (chapter 8)! Several vignettes preview emerging technologies: the Visible Human Project on the Internet (chapter 5); new skull base surgery (chapter 7); cord blood banking (chapter 14), and a living parent-to-child organ transplant (chapter 16).

Clinical Applications These practical sidebars apply chapter concepts by describing new technology, and sometimes bring in a historical perspective. Many clinical applications address common illnesses, such as migraines, neurological disorders, prostate enlargement, and breast cancer. Often Clinical Applications introduce molecular information, such as "Disease at the Organelle Level" (chapter 3) and "Molecular Causes of Cardiovascular Disease" (chapter 15). The new addition to chapter 3, "Faulty Ion Channels Cause Disease," weds the latest discoveries in cell biology to diverse disorders.

Some of the Clinical Applications new to this edition reflect recent headlines. For example, "Space Medicine" (chapter 15) explores the effects of prolonged microgravity on physiology in an astronaut. Clinical Application 3.4 discusses cloning, 13.5 investigates the hype in "Misrepresenting Melatonin," and 23.4 presents the Hensel twins, little girls who are joined from the neck down. New Clinical Applications on illnesses discuss acne (chapter 6), Parkinson's disease (chapter 11), and lung irritants (chapter 19).

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CLINICAL APPLICATION

Cloning

The human body is built of more than 200 types of specialized, or differentiated, cell types. Each cell contains certain subsets of the total genetic package present in all cells, these usually isn't any funny task. A nerve cell remains a nerve cell; an adipose cell stays an adipose cell. In contrast to a differentiated cell, a fertilized egg cell retains the potential to become any cell type—is like the college student before declaring a major. Such a cell is called "pluripotent." Something about the cytoplasm of the cell keeps it in a state where it can follow any cell "path."

What would happen if a nucleus from a differentiated cell was placed in a fertilized egg cell whose nucleus had been removed? Would the special egg-cytoplasm chemistry turn back the developmental clock, refuting the differentiated cell's nucleus to a pluripotent state, and possibly enabling it to specialize in a different way? In 1997, Scottish researchers did just that, in sheep. They took a cell from an adult sheep's breast and transferred its nucleus to a fertilized egg cell whose nucleus had been removed. The altered cell divided, and divided again, and when it was a ball of cells, it was implanted into an unrelated ewe. Development continued. On February 7, 1997, the result—a now-famous sheep named Dolly—graced the cover of *Nature*, magazine, and immediately triggered worldwide controversy (Fig. 30).

Dolly is a clone of the sheep that donated the breast cell, which means that, except for the small amount of mitochondrial DNA, the two animals are genetically identical. Creating Dolly was quite a feat—it took 277 tries. Despite the difficulty of the procedure, and the fact that it had not been performed on humans, public reaction in the months follow-

ing Dolly's debut was largely negative, as talk centered on cloning humans. Politicians called for "moratorium" votes, although enactment of banning legislation by far was their highest priority. And, films and sitcoms flourished (Fig. 30).

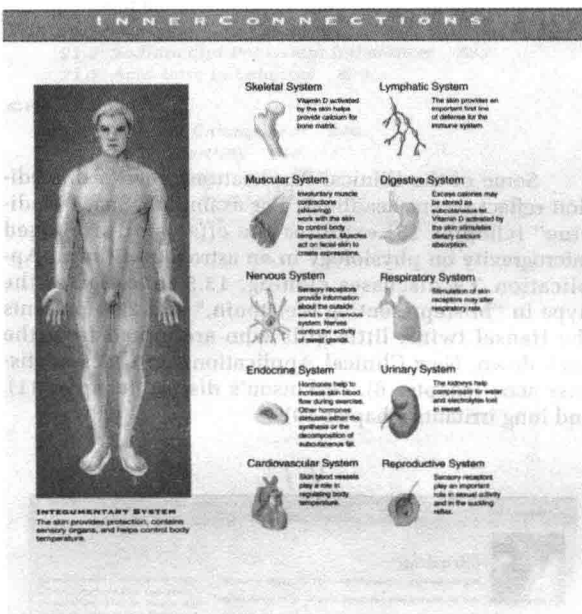
Lost in the heat of cloning was the fact that existing developmental potential to a specialized cell can have medical applications. Cloning would enable rapid mass production of cows genetically altered to produce proteins that are of use to humans as drugs—such cows, for instance, already make the human portion of tissue plasminogen activator, used as an antithrombotic agent to save lives following heart attacks and strokes. High genetic similarity allows to have cell surfaces compatible with humans are being constructed as organ donors for transplants—cloning would take up that technology. Sometimes, the ability to take a human cell back in time and perhaps give it a new specialization might lead to a way to regenerate injured tissue, or grow replacement parts.

Cloning humans raises a philosophical question: To what extent do genes determine who we are? That is, how identical are individuals who have the same genes? That question had never been answered by naturally occurring human clones—identical twins. Extensive analysis of identical twins who were separated at birth demonstrates that although they are physically alike, and share many health characteristics and even some peculiar habits, they also differ in many ways. The environment exerts powerful effects on who we are, contributing to characteristics such as personality traits that are hard to define biochemically.



InnerConnections These graphics, which appear at the ends of selected chapters, review and connect material at a glance. They conceptually link the highlighted organ system to every other, which reinforces the dynamic

interplays between groups of organs. InnerConnections can be used as springboards for class discussion, ideas for further study or term papers, review of chapter concepts, and reinforcement of the “big picture” in learning and applying the concepts of anatomy and physiology.



The blood cell micrographs in chapter 14 are taken at similar magnifications for ease of comparison, and use truer colors, for authenticity. Chapter 16’s topics are reorganized to improve flow, and the discussion of AIDS is completely updated. Chapter 19 presents a clarified explanation of tidal volume, and improved figures of microscopic and macroscopic lung anatomy. Chapter 21 includes a new figure on the distribution of body water, and a clearer explanation of acid-base balance.

Many changes and updates to the text come straight from the headlines, enabling students to see how the material in the classroom relates directly to real life. For example, discussion of the blood-brain barrier in Clinical Application 3.2 has new information on Gulf War syndrome. Chapter 3 also includes transcytosis in the discussion on membrane transport, which became better understood as researchers learned more about how HIV enters human cells. Chapter 10’s vignette on Alzheimer’s disease is expanded to cover the several genetic causes of this common illness, and Clinical Application 10.6 describes the biochemistry of addiction, including nicotine addiction. Chapter 14 discusses a new way to coat red blood cells to fashion a “universal” blood type, and chapter 17 mentions a new breath test to detect *Helicobacter pylori*, the bacterium that causes ulcers. Also in chapter 17, coverage of hepatitis includes newly discovered types of this illness. The coverage of obesity in chapter 18 discusses diet drugs, including those that have failed.

New Tables Several tables have been added to review chapter concepts or to add detail. These include Sleep Disorders (11.6), Clotting Factors (14.11), Types of Cytokines (16.4), Transplant Types (16.9), and Five Leading Causes of Death (23.6).

CONTENT, UPDATING, AND EMPHASIS CHANGES

Clarity is a major goal of a textbook, and we have made efforts to improve the readability and information content of certain difficult areas. Chapter 3 now features an updated discussion of membrane transport, and a clearer visual presentation of the pH scale. Cellular respiration, DNA synthesis and protein synthesis—by many accounts the most challenging subjects—are presented more clearly in chapter 4. The micrographs of tissues in chapter 5 are in sharper focus, and therefore easier to understand. Chapter 9 has a new, circular figure for the mechanism of muscle contraction, as well as a new accompanying discussion.

In chapter 11, a new discussion and figure describe the crossover point for ascending and descending nerve tracts, and the figures in this chapter are more consistent.

LEARNING TOOLS

A variety of tools make the study of human anatomy and physiology easier and more enjoyable. These aids help with mastering the basic concepts necessary to progress to more difficult material.

Understanding Words

This feature, found at the chapter beginnings and on the endsheets, helps build vocabulary. “Understanding Words” includes root words, stems, prefixes, and suffixes that reveal word meanings and origins. Each root and an example word that uses the root are defined. Knowing the roots from these lists helps in remembering scientific word meanings and in understanding newly encountered terms.

Chapter Objectives

Chapter objectives indicate what the reader should be able to do after mastering the information within the narrative. The review exercises at the end of each chapter are also phrased as detailed objectives, and these may be valuable to read before beginning a chapter. The chapter objectives and review exercises are guides to important sections of the narrative.

Introductory Vignettes

Stories that open each chapter vividly introduce the topic. These vignettes are all interesting real-life events, often taken from the headlines or from reports in medical or scientific journals.

Key Terms

Key terms and their phonetic pronunciations at the beginning of each chapter help build science vocabulary. The words in the lists are used in the chapter, and may be found in subsequent chapters. The glossary explains phonetic pronunciation.

Review Questions Within the Narrative

Review questions at the ends of major sections within each chapter reinforce main points. The ability to answer these questions without checking back indicates mastery of the material.

Illustrations, Photographs, and Tables

A textbook on human anatomy and physiology is more than a collection of written descriptions; it is also a visual experience. The many illustrations, photographs, and tables in each chapter are located near their related textual discussion. The art is designed and placed to help the reader visualize structures and processes, to clarify complex ideas, to represent how structures relate to each other, to summarize sections of the narrative, or to present pertinent data. Sets of special reference plates illustrate the structures and locations of the major internal organs of the body, depict the structural detail of the human skull, and help locate major features of the body surface and visualize organs exposed by the dissection of a cadaver.

Frequent use of icons in the art orient the reader and establish a sense of scale. Color is consistent from chapter to chapter; if a lymphatic pathway is green in one chapter, it is green elsewhere, also. Careful selection of new micrographs and rendering of new art better correlates the two.

Boxed Information

Short paragraphs in colored boxes appear throughout each chapter. Several are new to this edition. Some of these short boxes apply chapter ideas to clinical situations. Others discuss changes in organ structure and function that occur with aging. Many small boxes introduce new medical technology or discuss interesting medical experiments.

Clinical Applications

Throughout the chapters, longer boxed sections add flavor, depth, and perspective to major concepts by providing information on related pathology, offering historical insights, or exploring technological applications of knowledge of anatomy and physiology.

InnerConnections

These multipurpose illustrations, found at the ends of selected chapters, conceptually link the highlighted body system to every other system, reinforcing the dynamic interactions of groups of organs. These graphic representations review chapter concepts, make connections, and stress the “big picture” in learning and applying the concepts and facts of anatomy and physiology.

Clinical Terms

Lists of related terms often used in clinical situations end many chapters. These terms, along with their phonetic pronunciations and brief definitions, expand understanding of medical terminology.

Critical Thinking Questions

These questions at the end of each chapter apply main concepts to clinical or research situations, taking the student beyond memorization to utilization of knowledge.

Review Exercises


The review exercises at the end of each chapter check understanding of the major ideas in the narrative, in the sequence in which they are presented.


Appendices, Glossary, and Index

The appendices contain a variety of useful information. They include the following:

- A. Periodic Table of the Elements
- B. Units of Measurement and Their Equivalents
- C. Laboratory Tests of Clinical Importance

Multimedia Correlations

This eighth edition introduces the *Dynamic Human, Version 2.0, The 3-D Visual Guide to Anatomy and Physiology CD-ROM*, which interactively illustrates the complex relationships between anatomical structures and their functions in the human body. This program covers each body system, demonstrating clinical concepts, histology, and physiology. The *Dynamic Human* (dancing man) icon  appears in appropriate figure legends to alert the reader to the corresponding information. A list of correlating figures to specific sections of *The Dynamic Human, Version 2.0*, follows this preface on p. xxix.

A set of six videotapes contains nearly 100 animations of physiological processes integral to the study of human anatomy and physiology. Entitled *WCB's Life Science Animation (LSA) Videotape Series*, these videotapes cover such topics as cell division, genetics, and reproduction. A new LSA 3D Videotape with forty-two key biological processes is included in these correlations. A videotape icon  appears in appropriate figure legends to alert the reader to these animations. A list of the figures that relate to the animations follows this preface on p. xxxiii.

World Wide Web

Hole's Human Anatomy & Physiology is featured in the Applied Biology Resource Center at <http://www.mhhe.com/biosci/abio/>. Instructors will find links to hot topics relating to anatomy and physiology, teaching aids, product information, and a means to communicate with WCB/McGraw-Hill. Students will find additional study questions to help with test preparation. Visit our resource center regularly to get the latest updates.

SUPPLEMENTARY MATERIALS

The following supplementary materials are designed to help the instructor plan class work and presentations and to aid students in learning.

1. *Laboratory Manual for Hole's Human Anatomy and Physiology* (0-697-34217-4) by Terry R. Martin is designed to accompany the eighth edition of *Hole's Human Anatomy and Physiology*. The lab manual has been thoroughly revised.
2. *Instructor's Manual and Test Item File* (0-697-34210-7) by Michael F. Peters, Baker College of Port Huron, contains lecture suggestions and guidelines, application questions, and critical thinking issues for each chapter objective. It contains additional questions and issues to initiate student discussion. The Instructor's Manual also contains test items for each chapter to evaluate student understanding of the subject matter.

A *Visuals Testbank* is contained at the end of the Instructor's Manual. These transparency masters feature line art from the text with labels deleted for student quizzing or practice.

The *Answer Key for Chapter Review Exercises*, prepared by Connie Vinton-Schoepske, is also included within the Instructor's Manual.
3. *Student Study Guide* (0-697-34206-9) by Nancy A. Sickles Corbett contains chapter overviews, chapter objectives, focus questions, mastery tests, study activities, and answer keys corresponding to the chapters of the text.
4. A computerized test generator is offered free upon request to qualified adopters of this textbook. A complete test item file is available on computer diskette for Windows (0-697-34215-8) and Macintosh (0-697-34216-6) computers.
5. *Transparencies* (0-697-34209-3) include a set of 300 acetate sheets that complement classroom lectures or can be used for short quizzes.
6. Visit *Hole's Human Anatomy and Physiology* at www.mhhe.com/biosci/abio/. The web site has additional quizzing questions, links to hot topics, and other aids.
7. *Instructor's Manual for the Laboratory Manual* (0-697-34211-5) by Terry R. Martin provides a chart to correlate the laboratory manual with chapters of the textbook. For each exercise there is a list of required materials, the approximate time for completion, topics for discussion, and answers to the questions in the lab report.
8. *Histology Color Slides* (0-697-28931-1) include a set of seventy micrographs of tissues, organs, and other body features described in the textbook.
9. *Visual Resource Library* (0-697-42203-8) is a CD-ROM containing all of the line art in this textbook. The CD-ROM contains an easy-to-use program to view images quickly. Images may be imported into PowerPoint to customize multimedia presentations.
10. *Intelitool Supplement to accompany the Laboratory Manual* (0-697-33368-X) by Terry R. Martin contains four Intelitool laboratory exercises on muscle physiology, reflex physiology, electrocardiography, and spirometry.

Other learning aids available from WCB/McGraw-Hill include:

11. *The Dynamic Human CD-ROM, Version 2.0* (0-697-38935-9) illustrates the important relationship between anatomical structures and their functions in the human body. Realistic computer visualization and three-dimensional visualization are the premier features of this learning tool.
12. *The Dynamic Human Videodisc* (0-697-37994-9) contains more than twenty-five animations, 130 histological micrographs, clinical footage, and line art from *Hole's Human Anatomy and Physiology*.
13. *WCB's Life Science Animations (LSA)* contains fifty-three animations on five VHS videocassettes; Chemistry, The Cell, and Energetics (0-697-25068-7); Cell Division, Heredity, Genetics, Reproduction, and Development (0-697-25069-5); Animal Biology No. 1 (0-697-25070-9); Animal Biology No. 2 (0-697-25071-7); and Plant Biology, Evolution, and Ecology (0-697-26600-1). Another available videotape is *Physiological Concepts of Life Science* (0-697-21512-1). A new 3D videotape (0-07-290652-9) is also available with forty-two key biological processes all narrated and animated in vibrant color with dynamic three-dimensional graphics.
14. *Anatomy and Physiology Videodisc* (0-697-27716-X) is a four-sided videodisc containing more than thirty animations of physiological processes, as well as line art and micrographs.

15. *Virtual Physiology Lab CD-ROM* (0-697-37994-9) has ten simulations of animal-based experiments common in the physiology component of a laboratory course; allows students to repeat experiments for improved mastery.
16. *Laboratory Atlas of Anatomy and Physiology*, second edition, (0-697-39480-8) by Douglas Eder et al. is a full-color atlas containing histology, human skeletal anatomy, human muscular anatomical dissections, and reference tables.
17. *Case Histories in Human Physiology*, third edition, by Donna Van Wynaesbergh and Gregory Cooley is a web-based workbook that stimulates analytical thinking through case studies and problem solving; includes an instructor's answer key. (www.mhhe.com/biosci/ap/vanwyn/)
18. *The McGraw-Hill Learning Architecture* is a browser-based product that is a solution for delivering educational content over networked environments. The Learning Architecture connects students with each other as well as their instructor in an integrated environment. In addition to providing support and collaboration tools for users, such as built-in messaging and discussion lists, the Learning Architecture also manages all students on the server as well as the course material assigned to them. The benefits of this system to both instructors and students are tremendous (0-07-450946-2).
19. *WCB Anatomy and Physiology Videotape Series* consists of four videotapes, free to qualified adopters, including Blood Cell Counting, Identification and Grouping (0-697-11629-8); Introduction to the Human Cadaver and Prosection (0-697-11177-6); Introduction to Cat Dissection: Cat Musculature, (0-697-11630-1); and Internal Organs and Circulatory System of the Cat (0-697-13922-0).
20. *Human Anatomy and Physiology Study Cards*, third edition (0-697-26447-5), by Kent Van De Graaff, Ward Rhee, and Christopher Creek, is a boxed set of 300 illustrated cards (3 × 5 in.), each of which concisely summarizes a concept of structure or function, defines a term, and provides a concise table of related information.
21. *Explorations in Human Biology CD-ROM* (0-697-37907-8 Macintosh and 0-697-37906-X Windows) by George Johnson consists of sixteen interactive animations of human biology. *Explorations in Cell Biology and Genetics CD-ROM* (0-697-37908-6) by George Johnson contains seventeen animations that afford an engrossing way for students to delve into these often-challenging topics.
22. *Life Science Living Lexicon CD-ROM* (0-697-37993-0) by William Marchuk provides interactive vocabulary-building exercises. It includes the meanings of word roots, prefixes, and suffixes with illustrations and audio pronunciations.
23. *Survey of Infectious and Parasitic Diseases* (0-697-27535-3) by Kent M. Van De Graaff is a black-and-white booklet that presents the essential information on 100 of the most common and clinically significant diseases. A one-page presentation that includes pronunciation, derivation, definition, life cycle, description, signs and symptoms, laboratory diagnoses, and prevention/treatment is devoted to each of these diseases.
24. *Coloring Guide to Anatomy and Physiology* (0-697-17109-4) by Robert and Judith Stone emphasizes learning through the process of color association. The Coloring Guide provides a thorough review of anatomical and physiological concepts.
25. *Atlas of the Skeletal Muscles*, second edition (0-697-13790-8) by Robert and Judith Stone is a guide to the structure and function of human skeletal muscles. The illustrations help students locate muscles and understand their actions.

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- George E. Heath
University of Maryland Eastern Shore
- Drusilla Beal Jolly
Forsyth Technical Community College
- Beverly W. Juett
Midway College
- Kamal I. Kamal
Valencia Community College, West Campus
- Gary M. Kiebzak
Miller Orthopaedic Clinic Charlotte, NC
- Glenn E. Kietzmann
Wayne State College
- Alan Knowles
Pensacola Christian College
- Kristin Krause
Saint Thomas Aquinas College
- Gopal Krishna
Moberly Area Community College
- Barbara Lax
Community College of Allegheny County
- Nancy Longlet
Concordia College
- Lisa Lupini
Baker College of Flint
- Bradford D. Martin
La Sierra University
- William J. Mathena
Kaskaskia College
- Julie A. Medlin
Northwestern Michigan College
- Jim Miller
College of the Southwest
- Eli C. Minkoff
Bates College
- Robert Moldenhauer
Washtenaw Community College
- James (Jym) C. Moon
Western Iowa Technical Community College
- David Mork
Saint Cloud State University
- C. Aubrey Morris
Pensacola Junior College
- Tony E. Morris
Fairmont State College
- Steve C. Nunez
Sauk Valley Community College
- Nicole J. Okazaki
Southeastern Louisiana University
- Charles M. Page
El Camino College
- Mark A. Paulissen
McNeese State University
- Mary S. Rea
Sage Junior College
- Donald Rodd
University of Evansville
- Connie E. Rye
Bevill State Community College
- David A. Sandmire
University of New England
- Soma Sanyal
Penn State—Altoona
- Marilyn Shopper
Johnson County Community College
- Richard Sims
Jones County Junior College
- Katherine Smalley
Emporia State University
- Denise L. Smith
Skidmore College
- Michael E. Smith
Valdosta State University
- Paul M. Spannauer
Hudson Valley Community College
- Marian Spozio
Jefferson Community College
- Sarah Anne Staples
Andrew College
- John R. Steele
Ivy Tech State College
- Dennis M. Sullivan
Cedarville College
- P. Alice Summers
Dyersburg State Community College
- Patricia J. Thomas
Delgado Community College
- William R. Tobin
West Valley Central School
- Don Varnado
Southern Ohio College—Northern Kentucky Campus
- Dianne L. Vermillion
School of Nursing—University of Rochester
- Garry M. Wallace
Northwest College
- Norma J. Weekly
Wilkes Community College
- Christine A. Wilson
Community College of Allegheny County—Boyce Campus
- Barbara Wineinger
Vincennes University Jasper
- Clarence C. Wolfe
Northern Virginia Community College Annandale Campus

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